



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,185	07/29/2003	Yezdi Dordi	AMAT/2622.D1/CMP/ECP/RKK	9224

7590 12/08/2004

Patent Counsel  
APPLIED MATERIALS, INC.  
P.O. Box 450A  
Santa Clara, CA 95052

EXAMINER

WONG, EDNA

ART UNIT PAPER NUMBER

1753

DATE MAILED: 12/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/630,185

Applicant(s)

DORDI ET AL.

Examiner

Edna Wong

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>December 10, 2003</u> .   | 6) <input type="checkbox"/> Other: ____                                     |

***Specification***

The disclosure is objected to because of the following informalities:

page 2, line 2, the words -- now US Patent No. 6,599,402, -- should be inserted after the number "2003".

page 2, line 3, the words -- now US Patent No. 6,416,647, -- should be inserted after the number "1999".

page 10, line 13, "Figures 2A and 3A" are missing.

page 12, line 3, the words -- (not shown) -- should be inserted after the number "274".

page 14, line 20, the words -- (not shown) -- should be inserted after the number "259".

page 17, line 16, the words -- (not shown) -- should be inserted after the number "351".

page 21, line 17, reference character "237" has been used to designate both an actuator and the agitator (from page 21, line 2). It is unclear what reference character

"237" designates.

page 23, line 13, the words -- (not shown) -- should be inserted after the number "266".

page 24, line 7, the words -- (not shown) -- should be inserted after the number "272".

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

Claims 3 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3

line 1, "further comprises" lacks antecedent basis. Claim 1 does not recite what the step of holding the substrate comprised. It is suggested that the word "further" be deleted.

Claim 5

lines 1-2, "the plating surface annular ring" lacks antecedent basis.

Claim 11

line 1, "further comprises" lacks antecedent basis. Claim 1 does not recite what the step of positioning the anode comprised. It is suggested that the word "further" be deleted.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

I. Claims **1-2, 4-5, 8-13, 16 and 17** are rejected under 35 U.S.C. 102(e) as being anticipated by **Ting et al.** (US Patent No. 6,017,437).

Ting teaches a method for electroplating a metal onto a substrate plating surface, comprising:

(a) holding a substrate **35** with the substrate plating surface face-up on a rotatable substrate support member **13** having means for holding **44** and rotating **17** the substrate during an electroplating process;

(b) positioning an anode **14** above the substrate plating surface;

(c) flowing an electroplating solution **38** between the anode and the substrate

plating surface; and

(d) applying a plating bias between the substrate plating surface and the anode to electroplate the metal onto the plating surface (col. 4, lines 9-18; col. 6, lines 59-62; col. 11, lines 31-35; and Figs. 2 and 5).

The step of holding the substrate comprises providing a vacuum suction **44** between the substrate support member and a back side of the substrate (col. 4, lines 38-44).

The applying a plating bias comprises positioning a cathode contact ring (= four electrodes **15** spaced equidistantly around the bottom end of the sleeve **12**. Each electrode **15** is affixed to the bottom surface of the sleeve **12** by coupling it to an electrical contact **41**) in electrical contact with the plating surface (= each electrode **15** is attached to its corresponding electrical conductor **41** at one end and the other end makes contact with the edge of the wafer **35**), the cathode contact ring defining a fluid processing volume **28** between the ring and the substrate surface (col. 7, line 59 to col. 8, line 7).

The cathode contact ring contacts the plating surface annular ring and a plurality of contact pins **15** extending radially inwardly therefrom, and positioning an annular seal **42** radially inward of the contact pins (col. 7, line 57 to col. 8, line 25; and Fig. 9).

The method further comprises rotating the substrate while flowing the electroplating solution between the anode and the substrate plating surface (col. 5, line 55 to col. 6, line 4).

The method further comprises vibrating the substrate while flowing the electroplating solution between the anode and the substrate plating surface (col. 5, line 67 to col. 6, line 4).

Flowing the electroplating solution further comprises filling the fluid processing volume (= as the level of the fluid rises, the overflow is discharged through the openings **30**) [col. 11, lines 47-48].

Positioning the anode further comprises positioning the anode in electrical communication with the fluid processing volume (= the anode electrode **14** is made to reside in the containment region **28**) [col. 6, lines 38-42].

The method further comprises removing the cathode contact ring (= lowered position) and rinsing the substrate plating surface with a rinse agent (= DI water) [col. 11, lines 57-66; and Fig. 6].

The step of rinsing the substrate plating surface comprises spraying a rinse agent over the substrate plating surface while rotating the substrate support within (= the wafer **35** is usually spinning at a relatively high rpm to enhance rinsing and drying of the wafer **35**) [col. 11, line 66 to col. 12, line 6].

The method further comprises spin-drying the substrate (= the wafer **35** is usually spinning to enhance rinsing and drying of the wafer **35**) [col. 11, line 66 to col. 12, line 6].

The method further comprises supplying the electroplating solution **37** into a cavity ring **16** disposed above the anode (col. 7, lines 24-41; and Fig. 8).

II. Claims **19-21** are rejected under 35 U.S.C. 102(e) as being anticipated by **Ting et al.** (US Patent No. 6,017,437).

Ting teaches a method for electroplating a metal onto a substrate plating surface, comprising:

(a) positioning the substrate plating surface face-up on a support member **13**;  
(b) positioning the support member at a first vertical position in a processing cell (Fig. 5);

(c) electrically contacting a cathode clamp ring (= four electrodes **15** spaced equidistantly around the bottom end of the sleeve **12**. Each electrode **15** is affixed to the bottom surface of the sleeve **12** by coupling it to an electrical contact **41**) to the substrate plating surface (= each electrode **15** is attached to its corresponding electrical conductor **41** at one end and the other end makes contact with the edge of the wafer **35**) [col. 7, line 59 to col. 8, line 7];

(d) flowing an electroplating solution **38** from an anode **14** to the substrate plating surface while rotating **17** the substrate plating surface at the first vertical position (col. 5, line 55 to col. 6, line 4);

(f) positioning the support member at a second vertical position in the cell, the second position being different from the first position (Fig. 6); and

(g) rinsing the substrate plating surface with a rinse agent at the second vertical position (col. 11, line 57 to col. 12, line 6).

The method further comprises spin-drying the substrate plating surface (= the



wafer **35** is usually spinning at a relatively high rpm to enhance rinsing and drying of the wafer **35**) [col. 11, line 66 to col. 12, line 6].

The method further comprises draining the electroplating solution to an electroplating solution reservoir (= the drain **23** is coupled to a container for containing the electrolyte or to a waste treatment component of the system) [col. 10, line 65 to col. 11, line 4].

III. Claims **23, 25 and 26** are rejected under 35 U.S.C. 102(e) as being anticipated by **Ting et al.** (US Patent No. 6,017,437).

Ting teaches a method for plating and rinsing a substrate in a processing cell, comprising:

(a) positioning the substrate face-up on a rotatable substrate support member **13** and positioning the substrate support member at a plating position in the cell (Fig. 5);

(b) electrically contacting a plating surface of the substrate with a cathode electrode **15**;

(c) forming a fluid processing volume **28** above the plating surface;

(d) positioning an anode **14** in electrical communication with the processing volume;

(e) applying a plating bias (col. 11, lines 31-35) between the anode and the cathode electrode to plate a metal (col. 12, lines 8-14) from the fluid processing volume onto the plating surface in the plating position;

(f) moving the substrate support member to a rinsing position (Fig. 6); and  
(g) dispensing a rinsing solution onto the plating surface while rotating the substrate (col. 11, line 59 to col. 12, line 6).

The method further comprises capturing a plating solution used in the plating process with a first fluid receiving member (= the drain **23** is coupled to a container for containing the electrolyte or to a waste treatment component of the system) [col. 10, line 65 to col. 11, line 4].

Electrically contacting the plating surface comprises positioning a cathode contact ring having a plurality of radially positioned substrate contact pins **15** positioned thereon such that the contact pins electrically engage a perimeter of the substrate (col. 7, line 57 to col. 8, line 7; and Fig. 9).

The method further comprises sealably engaging the perimeter of the plating surface with an annular seal **42** positioned radially inward of the contact pins (col. 8, lines 17-25; and Fig. 9).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims **3, 7, 14-15 and 18** are rejected under 35 U.S.C. 103(a) as being

unpatentable over **Ting et al.** (US Patent No. 6,017,437) as applied to claims 1-2, 4-5, 8-13, 16 and 17 above.

Ting is as applied above and incorporated herein.

Ting does not teach wherein the step of holding the substrate further comprises providing a peripheral seal between the substrate support member and a back side of the substrate.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Ting with wherein the step of holding the substrate further comprises providing a peripheral seal between the substrate support member and a back side of the substrate because Ting teaches that disposing a seal between the wafer end of the electrode **15** and the interior wall of the sleeve. The seal **42** is positioned adjacent to the interior wall of the sleeve **12** so that it can effectively inhibit the electrolyte from reaching the electrode **15** when power is to be applied to the electrode (col. 8, lines 17-25; and Fig. 9).

Furthermore, if flow gaps **43** are located at the bottom of the sleeve-wafer interface, then individual seals, preferably U-shaped, are required at each of the electrode contact locations because of the gaps (col. 8, lines 44-50).

As shown in Fig. 9, the peripheral seal **42** would have also inhibited the

electrolyte from reaching the back side of the substrate.

Thus, depending upon the design of the processing chamber, the peripheral seal would have been placed to isolate the electrolyte from reaching the undesired areas (col. 13, lines 1-12).

As to wherein the anode is consumed during the operation of the electroplating method, soluble anodes are conventional in the electroplating art for supplying plating ions to the electrolyte. It would have been well within the skill of the artisan to have used a soluble anode in the electroplating method of Ting because it would have been doing the same endeavor.

As to wherein the method further comprises draining the rinse agent back to a rinse agent reservoir; and wherein the method further comprises purifying the rinse agent in a purifier, Ting teaches that the drain **23** is coupled to a container for containing the electrolyte or to a waste treatment component of the system. The delivery and removal of such chemicals and fluids to/from a processing chamber are known in the art (col. 10, line 65 to col. 11, line 4). Thus, it is well within the skill of the artisan to have recycled and regenerated the electrolyte for reuse.

As to wherein the method further comprises moving the cavity ring while flowing

the electroplating solution, it is well within the skill of the artisan to have moved (e.g., rotate) the cavity ring **16** of Ting (Fig. 8) to uniformly distribute the fluid over the surface of the wafer **35**.

Furthermore, it is within the level of ordinary skill in the art to make a component movable. *In re Lindberg* 194 F 2d 732,93 USPQ 23 (CCPA 1952) and MPEP § 2144.04(V)(A).

II. Claim **6** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ting et al.** (US Patent No. 6,017,437) as applied to claims 1-2, 4-5, 8-13, 16 and 17 above, and further in view of **JP 2-217428**.

Ting is as applied above and incorporated herein.

Ting does not teach wherein the electroplating solution flows through perforations in the anode.

However, the JP reference teaches electroplating a substrate plating surface faced up on a support (abstract; and Fig. 2(a)).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Ting with wherein the electroplating solution flows through perforations in the anode because the JP reference teaches that a solid anode (Fig. 1(a)) and a perforated anode (Fig.

2(a)) are functionally equivalent in electroplating a substrate plating surface faced up on a support. Thus, it would have been well within the skill of the artisan to have used a perforated anode in the electroplating method of Ting because it would have been doing the same endeavor.

III. Claim **22** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ting et al.** (US Patent No. 6,017,437) as applied to claims 19-21 above.

Ting is as applied above and incorporated herein.

Ting does not teach wherein the method further comprises draining the rinse agent to a rinse drain and purifying the rinse agent.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Ting with wherein the method further comprises draining the rinse agent to a rinse drain and purifying the rinse agent because Ting teaches that the drain **23** is coupled to a container for containing the electrolyte or to a waste treatment component of the system. The delivery and removal of such chemicals and fluids to/from a processing chamber are known in the art (col. 10, line 65 to col. 11, line 4). Thus, it is well within the skill of the artisan to have recycled and regenerated the rinse agent for reuse.

IV. Claim **24** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ting et al.** (US Patent No. 6,017,437) as applied to claims 23, 25 and 26 above

Ting is as applied above and incorporated herein.

Ting does not teach wherein the method further comprises capturing the rinsing solution with a second fluid receiving member.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Ting with wherein the method further comprises capturing the rinsing solution with a second fluid receiving member because Ting teaches that the drain **23** is coupled to a container for containing the electrolyte or to a waste treatment component of the system. The delivery and removal of such chemicals and fluids to/from a processing chamber are known in the art (col. 10, line 65 to col. 11, line 4). Thus, it is well within the skill of the artisan to have recycled and regenerated the rinsing solution with a second fluid receiving member.

V. Claim **27** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ting et al.** (US Patent No. 6,017,437) as applied to claims 23, 25 and 26 above, and further in view of **JP 2-217428**.

Ting is as applied above and incorporated herein.

Ting does not teach wherein the method further comprises flowing an electroplating solution through a plurality of perforations in the anode to fill the fluid processing volume.

However, the JP reference teaches electroplating a substrate plating surface faced up on a support (abstract; and Fig. 2(a)).

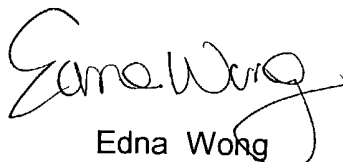
Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Ting with wherein the method further comprises flowing an electroplating solution through a plurality of perforations in the anode to fill the fluid processing volume because the JP reference teaches that a solid anode (Fig. 1(a)) and a perforated anode (Fig. 2(a)) are functionally equivalent in electroplating a substrate plating surface faced up on a support. Thus, it would have been well within the skill of the artisan to have used a perforated anode in the electroplating method of Ting because it would have been doing the same endeavor.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 3:30 pm, Flex Schedule.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Edna Wong  
Primary Examiner  
Art Unit 1753

EW  
December 2, 2004